



# Tree Planting Procedure *for Small, Bare-Root Seedlings*

David Mercker, Extension Specialist  
Forestry, Wildlife and Fisheries

*Tree seedlings receive foremost care while growing in a managed nursery:*

fertile soil; ample moisture; and weed, insect and disease control. Lifting seedlings out of this comfort zone shocks them. Consider: they are dislodged from the soil; their roots are often torn; they are handled several times; they are packaged, shipped, exposed to wind and heat, and placed in planting bags or machine buckets; their roots are unveiled to open air; and they are often replanted in harsh soil where they are left to high temperatures with the *hope* of adequate precipitation for sustenance through the first few growing seasons (Figure 1).

If key steps are not carefully followed during handling and planting, mortality rate rises. Both hardwood and pine seedling survival is more likely if attention is given to the following:

1. *Plant in late fall or early winter.*  
In southern U.S. locations, mid-December through mid-March are the best months for planting seedlings. By planting well before the growing season, roots will settle into their new environment and prepare to supply water to the buds and foliage when warmer temperatures arrive.
2. *Plant on cooler days.*  
Temperatures that range between 35–60 degrees F are best for planting. Higher temperatures cause transpiration to

**“It is better not to have planted, than to have planted incorrectly.”**

Figure 1.  
Black walnut (*Juglans nigra L.*) seedlings ready for machine planting. Take care not to expose the roots to air for long periods.





increase and will dry the roots (transpiration is the process by which water vapor leaves a living plant and enters the atmosphere). Lower temperatures could freeze the roots, causing mortality.

### 3. *Protect seedlings during vehicular transport.*

Transporting seedlings in an enclosed vehicle is preferred to open-air transport. Cover the bags of seedlings with a tarp during transport. High winds increase transpiration. It is best to transport on cool days or at cooler times of the day.

### 4. *Store seedlings properly.*

Find a place to store your seedlings well ahead of their arrival from the nursery. If immediate planting is not possible, seedlings should be stored in an enclosed cooler where temperature and moisture are regulated. Keeping the air temperature low and the humidity high will slow transpiration. Maintain air temperature at 35-38 degrees F. When stacking bags of seedlings for long storage periods, crisscross them, leaving large air gaps for better ventilation. Otherwise, heat will build near the center of the bags. If temperature-controlled facilities are not available, or if the seedlings will be planted quickly, store the seedlings in a cool, dark location, away from the wind (in a cellar, barn, etc.) It is best not to open the bags; however, if the bags cannot be stored in a cool location, open them periodically for inspection to determine if watering is necessary. Be careful not to add too much water. Rather, keep seedlings moist, not saturated. Excess water can harm the roots if left too long.

### 5. *Treat seedlings properly at the planting site.*

Seedlings can deteriorate rapidly, particularly once on the planting site. High air temperature and wind will stress the seedlings (especially when atmosphere humidity is low). Park your

transport vehicle in the shade, in lower spots, shielding the seedlings from destructive elements (heat, light and wind). Insulation tarps provide desirable protection. Avoid opening the seedling bags until near the time of planting. Avoid exposing the roots to the open air for very long. If air temperature reaches 75 degrees F, planting should cease. Large portable coolers are ideal for field storage of seedlings, but are often not available.

### 6. *Plant seedlings using the best method.*

Two methods are used for planting tree seedlings: hand planting and machine planting. Both are acceptable. **Hand planting** (Figure 2) is more common on steeper terrain or in forested areas that have recently been harvested. Seedlings are placed in planting bags, then hand tools such as a dibble bar or hoe-dad is used to penetrate the soil and create an opening for the roots. Once the seedling is planted, the hole is resealed with the tool and foot pressure (to close soil air pockets). Take care not to “J” root the seedlings by jamming the roots into the ground. Rather, insert the roots in a natural, vertical position.

A **machine planter** is normally pulled behind a tractor with a 3-point hitch (Figure 3).

Figure 2.  
Hand planting is more common with small projects or in difficult terrain.





Figure 3.  
Machine planting to restore  
120 acres of bottomland row  
crops to native hardwood  
timber at the West Tennessee  
Center for Research and  
Education (January 2004).

The planter has a coulter (slicing through the soil), a foot (pulling the machine below surface level), trencher plates (opening the soil for seedling placement) and packing wheels to re-close and compress the soil. Machine planting, as compared to hand planting, generally has a slightly better survival rate, delivers more consistency in spacing and works best when converting old fields or pastures to forest. Trees *can* be improperly planted with a machine. The machine should not be operated faster than 3 mph (causing the roots to become crooked and the trees to lean). Trees (and the machine) must be checked frequently, especially when different soil textures are encountered.

Plant seedlings deep, at least to the original level planted while in the nursery (as noted by the darkened ring where the lower stem meets the roots). It's better to plant slightly too deep than too shallow. Make sure that all air pockets are sealed by applying pressure to the soil surrounding the seedling. Straighten seedlings as needed. Be certain not to allow any lateral roots to be exposed above the soil level.

### 7. *Conduct a survival check.*

A survival exam should be conducted near the end of the first growing season. Hardwood trees may need to be examined in late summer before the leaves turn color and fall off. The survival plots should be systematically dispersed and measure one-hundredth of an acre (such plots have a radius of 11 feet 9.3 inches). If cost-share funds were used to establish the planting, it may be necessary to maintain a certain level or percentage of live seedlings. In most cases, a survival rate of 300 or more trees per acre is recommended. The original planting plan should have specified this minimum survival level. Your professional forester can assist with the survival check and replanting recommendations.

Cost-share assistance for tree planting from the federal or state government is occasionally available. For more information regarding planning and implementing a tree planting project, contact the Tennessee Department of Agriculture, Forestry Division, at 615-837-5411 or <http://www.state.tn.us/agriculture/forestry/index.html>. If done correctly, seedling survival is more likely, and the benefits of forest restoration will be enjoyed more quickly.





Visit the UT Extension Web site at  
<http://www.utextension.utk.edu/>

SP663-1M-11/05 E12-4915-00-005-06 06-0096

Copyright 2005 The University of Tennessee. All rights reserved. This document may be reproduced and distributed for nonprofit educational purposes providing that credit is given to University of Tennessee Extension.

Programs in agriculture and natural resources, 4-H youth development, family and consumer sciences, and resource development.  
University of Tennessee Institute of Agriculture, U.S. Department of Agriculture and county governments cooperating.  
UT Extension provides equal opportunities in programs and employment.

